The Efficiency of the Costa Rican Payment for Environmental Services Program under Discussion

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Introduction[4]

Since the mid 90's, the concepts of ecosystem and environmental services have enjoyed a growing popularity at academic and operational levels. According to the authors of the Millennium Ecosystem Assessment (MEA, 2005), ecosystem services are the benefits provided by ecosystems tohumans. They are divided into four categories: provisioning services (e.g.food, water), regulating services (e.g.regulation of floods, droughts, soils degradation, diseases), supporting services (e.gsoils formation, biogeochemical cycles) and cultural and amenity services. Environmental services are only one part of ecosystem services: they correspond to the benefits generated by humans with the support of ecosystems (Lugo, 2008). They are often considered as public goods and positive externalities by the economic theory, not being adequately valued and thus underproduced (Cornes and Sandler, 1996).

Several researchers consider either the monetary valuation of environmental services (Costanza and al. 1997; Pagiola and al. 2004; Chevassus-Au-Louis and al. 2009), or the tools allowing to internalize positive externalities induced by these services. To promote the provision of these services, several schemes are possible (e.g regulation, taxes, voluntary approaches), one of those being the remuneration of some actions (or renunciation to others

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actions) for maintaining, restoring or improving of a clearly defined service, this scheme refers to "Payment for Environmental Services" (PES). PES have been especially used to promote (or restrict) forestal uses and it relates mostly to 4 types of environmental services: carbon maintaining or sequestration, biodiversity protection, water resources protection and landscape beauty (Example: ecotouristic activities) (Landell-Mills and Porras, 2002 ; Wunder, 2005). Wunder (2005, 2006, 2007) defines PES as: « *a voluntary transaction where a well-defined ES (or a land-use likely to secure that service) is being 'bought' by a (minimum one) ES buyer from a (minimum one) ES provider if and only if the ES provider secures ES provision during a determined time (conditionality)* ».

PES have being largely experimented in developed countries (Europe, USA, Australia), this tool appears less widespread in developing countries where significant obstacles seem to slow down its implementation (lack of willingness to pay among the beneficiaries, environmental services poorly defined, difficulties to contract, poorly defined property rights among others) Some Latin American countries, such as Costa Rica or Mexico, are often quoted as precursors in the world implementing PES. Our contribution will focus on the case of Costa Rica to shed light on the debates over the assessment of PES. In Costa Rica, the PES program (PESP ; « *Programa de Pago por Servicios Ambientales* » – PPSA), was instituted in 1996 by the forest law 7575, is part of a 20 years-long process of forest policy evolution and appears undeniably as a precursor and a model in the developing world (Pagiola, Bishop and Landell-Mills, 2002 ; Sembrès, 2007). The National Forestry Financing Fund (FONAFIFO[5]), trust fund in charge of the PESP management, buys to land owners, usually individuals, the environmental services generated by some defined land uses, mainly forest ones (cf Box 1). Four environmental services are explicitly recognized by the 7575 forest law: mitigation of greenhouse gases emissions, water protection, biodiversity protection, and scenic beauty. This program is unique in terms of the population concerned, its capacity to generate payments from a quite large diversity of actors[6] and the size of the contracted areas in proportion to the size of the country.

[5] Instituted in 1996 by article 46 of the 7575 forest law, the FONAFIFO, trust fund endowed with an instrumental juridical personality and administered by representatives of the public and private sectors, has the duty to fund small and medium forest producers mostly through a loan program and the PESP. It gets the resources for the payment of environmental services and manages thus program. Since 2003, FONAFIFO activity is supported, in addition to its central office, by 7 regional offices (9 currently) located in the SINAC (National System of Conservation Areas) offices, in charge of the selection and contracting process , that used to be SINAC responsibility from 1997 to 2002.

[6] These payments come mainly from a tax on fuel but also from international donors as loans or donations (World Bank, Global Environmental Fund, GTZ) and from the national private sector.

From 1997 to 2008, 8 345 contracts of PES have covered 670 000 ha of forest, that is to say some 13% of the national territory.

Box 1 PESP modalities

In 1997, at the launching of the program, three types of land uses could generate payments:

- New plantation (PESP-Reforestation),
- Forest management (PESP-Forest management),
- Forest protection (PESP-Protection).

In 2009, PESP have 4 main modalities, some of them presenting some variants:

- New plantation (PESP-Reforestation),
- « Tree plantation in agroforestry systems » (PPSE-Agroforestry systems) instituted in 2003, differing from PESP-Reforestation because it pays for tree plantations in an agroforestry area such as a coffee plantation
- « Natural regeneration » (PESP-Natural regeneration), instituted in 2006, differing from PESP-Reforestation because it pays for a natural process by which the forest regenerate itself and not a plantation by man. Three variants of this modality are distinguished :
  - « Natural regeneration with productive potential », in which trees can be farmed.
  - « Natural regeneration in pastures», in which forest farming is not foreseen.
- « Natural regeneration in Kyoto or carbon land », defined as the lands allowing FONAFIFO to trade carbon sequestration services.
- Forest protection (PPSE-Protection), for which 4 variants can be distinguished since 2009 :
  - « Protection in wildlife protected areas » targets the lands located inside the wildlife protected areas.
  - « Protection in the conservation blanks » targets important lands for conservation not yet covered by the protected areas system.
  - « Protection of hydrological resources » targets important lands for water resources protection.
  - « Protection of forest » targets others lands.

The « forest management » modality has been removed from the PESP in 2002 while the modality of « existing plantation » (PESP-Existing plantation) created in 1998 has functioned only in 1998, 1999 and 2003. It allowed already existing plantation to benefit from PESP, differing from PESP-Reforestation that could only benefit to new plantations.

Generally speaking, PES mechanisms are an issue of fierce debate concerning their implementation in developing countries. Some authors present PES as the tool with the highest potential to curb environmental resources degradation, the fittest tool to overcome imperfections and limited successes of Integrated Conservation and Development Projects (ICDP) and sustainable resources management projects (Ferraro and Kiss, 2002 ; Pagiola and al., 2002 ; Niesten and Rice, 2004 ; Wunder, 2005). Others authors are more sceptical on its effectiveness (capacity to reach the defined environmental objectives), its efficiency (relation between effectiveness reached and the economic investment required), its fairness, its legitimacy and its sustainability (Bulkan, 2004; Karsenty and Nasi, 2004; Romero and Andrade, 2004; Engel and al. 2008, Wunder and al. 2008). They have reservations about the expected outcomes of PES underlining the difficulties of implementation (Examples: imperfect ecological and economics knowledge, high level of transaction costs, inadequate methodology for the monitoring of the state of environmental services) or identify negative effects of this

mechanism (commodification of environmental services, appropriation of the instrument by actors not initially targeted, strategy for funds capturing, weakening of public authorities and of the role of environmental public policies, ecological systems degradation, hindrance to the development of new and more sustainable practices, worsening of inequalities.

The aim of our contribution is to assess the efficiency of the Costa Rican PESP, as a conservation tool[7], while discussing some proposed trails to improve this PES program. Our study is mostly focused on the forest protection modality, by far the most important of the PESP[8]. It is based on a review of the literature (scientific articles and original reports) and on some interviews of different actors involved in the design, implementation and evolution of the program such as: civil servants, researchers, representatives of the private sector, of forestry organizations, conducted in 2009 and 2010.

1. The environmental effectiveness of the Costa Rican PESP under discussion

We will analyze the effectiveness of Costa Rican PESP in three stages: we will first study to what extent the PESP has really contributed to the extension of forest cover, the following step will be to analyze if the PESP has generated the expected environmental services, to finally conclude with the evaluation of the sustainability of PESP environmental outcomes.

1. The impact on forest cover

About 670 000 hectares of forest have been under contract on the framework of the PESP since 1997, that is to say 13% of the national territory while the forest cover which

[7] In the framework of this PES program, objectives are not exclusively environmental (extension of forest cover, environmental services generation) but include, since 2002, the fight against poverty (cf. the statement of Carlos Manuel Rodriguez, the ministry of environment leading this transformation, quoted in Hartshorn and al. (2005): *"…we need to stop viewing the PSA program as merely a tool for preserving biodiversity and promoting the planting of forests. Instead, we need to see it as a tool for rural development that also includes reforestation and biodiversity conservation.*"). It is noticeable that one of the implicit objectives is to support the adoption of practices ecologically more sustainable for the forest sector. Although there is no a priori reasons why the environmental objective should prevail over the fight against poverty in the case of PES (Muradian and al. 2009; Pascual and al. 2009), we have chosen here to focus on the assessment of the program as a conservation tool.

[8] This modality concentrates most of the forest area contracted in the framework of the PESP: about 90% of the forest area under contract in the frameworkof the PESP between 1997 and 2008 (without considering the modality of tree plantation in agroforestry systems for which the scope is being measured in terms of number of trees and not in terms of hectares).

represented 42% of the territory in 1997, has reached 48%[9] in 2005 (Calvo-Alvarado and Sánchez-Azofeifa, 2007). The importance of the scale of the PESP and the success of the country in reversing the deforestation trend make it tempting to establish a causal link between the PESP and the reduction of deforestation. However, the outcomes obtained in terms of environmental effectiveness are to be placed in perspective for several reasons.

First, Pagiola (2008) notices that it is difficult to isolate the effects of PESP of those induced by others environmental policies and of the economic context. Indeed, the PESP has been instituted at the same time of the prohibition of deforestation[10], for which it represents in some ways compensation. As this measure has allowed reducing deforestation and as it has been made acceptable and thus possible by the PESP, this program can claim to have contributed indirectly to reduce deforestation (Pfaff and al. 2006). Nevertheless, the protected areas system (Sanchez-Azofeifa, 2007), the fall of the profitability of livestock farming reducing the incentive to convert forests in pastures, in particular in isolated areas (White and al. 2001, Arroyo-Mora and al. 2005 quoted by Pagiola 2008), the development of ecotourism (Rojas and Aylward, 2003) and the increase in emigration (Kull and al. 2007) have also contributed to reduce deforestation. Furthermore, the trend of increasing forest cover dates from the early 1990s that is to say before the launching of the PESP (Wunder, 2007).

Moreover, several studies show that many beneficiaries of the PESP say that they would have protected the forest if the PESP-Protection did not exist (Miranda and al 2003; Ortiz and al. 2003). Ortiz and al. (2003) argue that « *the real effectiveness in its modality of « forest protection » has a value ranging from 22% to 27%, numbers that respectively represent the percentage of the land owners that would dedicate their farms to agriculture and livestock farming in case the PESP does not exist and the proportion of PESP beneficiaries who would not be willing to dedicate themselves to conservation in case the PESP would be suspended*[11]. » The authors indicate that 67% of the sample of participants to the PESP-Protection would be willing to preserve the forest without receiving PES, that 55 % would

[9] Forest coverture in 2005 was evaluated to 48% not including mangrove swamp, moorand forestry plantation; Fonafifo estimates that the total forest area represented 51 % of the national territory in 2005 (Sanchez, interview 2010).

[10] The law 7575 says in its article 19 that « On the lands covered with forest, changing land uses will not be allowed » (« *En terrenos cubiertos de bosque, no se permitirá cambiar el uso del suelo* »).

[11] "*La efectividad real del PSA-Protección tiene un valor entre un 22% y 27%, valores que corresponden, respectivamente, al porcentaje de propietarios que dedicarían sus fincas a agricultura y ganadería en caso de que no existiera el PSA-Protección, y el de los que no están dispuestos a dedicarse a la conservación si el PSA se suspendiera* »

maintain the forest cover of their lands in case the PESP does not exist (45% for conservation, 8% for forest farming and 2% for ecotourism) and that 43% were already protecting the forest before receiving PES. These answers, questioning the additionality[12] of the program, are however to be put in perspective to the extent that deforestation being forbidden, interviewees may not have wanted to divulge their interest in engaging in this illegal activity (Hartshorn and al. 2005). According to Pagiola (2008), the fact that the PESP has a long awaiting list of people wishing to participate in the program suggests that deforestation is not very profitable in many areas. In fact, participation to the PESP is voluntary, and the land owners choose to participate or not to the program, which can lead to integrate lands whose conservation implies the lowest opportunity costs and whose deforestation risks are the lowest, characterizing a problem of anti-selection (Sanchez-Azofeifa and al. 2007). Several studies (Hartshorn and al. 2005, Ortiz and al. 2003, Zbinden and Lee 2005) underline the poverty of the soils of the lands under PES-Protection contracts: as about three quarters of the soils[13] of these lands don't allow an agricultural use, these lands would probably have not been converted to non forest uses (pastures, agriculture or others) if the PESP did not exist[14].

Thirdly, formal tests to assess the impact of the PES-Protection on forest cover give mixed results. Robalino and al. (2008) consider that between 2000 and 2005, the PESP has allowed to reduce deforestation in 0,4 % of the area contracted each year, a rate slightly higher than the national average rate of deforestation (0,3%) but still low. This result is higher than what Pfaff and al. (2007) have found for the 1997 to 2000 period: lands under PESP contract were then less threatened by deforestation (0,2%) and the PESP have thus allowed to avoid deforestation for less than 0,2% of the lands under contract each year. Robalino and al. (2008) attribute this slight improvement at a better targeting[15] of the program and at an increase of

[12] For a PES scheme, additionality consists in paying for the adoption of practices that would not have been adopted in the absence of payment (Engel and al, 2008).

[13] According to Hartshorn and al. (2005), 51% of the contracts under PES-Protection are on lands allowing only forest management and forest protection and in addition 20% are on lands with « strong limitations for agriculture ». According to Ortiz and al. (2003) 28, 2% of the total of lands under contrat of PES-Protection don't allow any productive activity, while 48,6% of the lands under contract of PES-Protection could be used for forest farming and 23,2% for agricultural activities.

[14] In a sample of 100 bénéficiaries of the PESP-Protection interviewed by Ortiz and al. (2003), 36 have indicated that the forest under PES-Protection contract has been used before for pastures, a number superior to the percentage of lands fit for agriculture (23, 2%), which leads to think that déforestation can hit lands unfit for agriculture and that it can be avoided by the PESP.

[15] While the Costa Rican PESP dit not initially prioritize applications to the program, some criterias have been defined since 1999 in order to target the most important lands for ES provision and also since 2004 from the point of view of the fight against poverty. Priority areas for the protection modality, that concentrates the bulk of the contracted areas, correspond today (FONAFIFO processes manual, 2009) to: the « conservation blanks » (« *vacios de conservacion* » that correspond to the strategic areas for conservation not yet integrated in the

the risk of deforestation at the national level. Tattenbach and al. (2006) have developed an econometric model of gross deforestation for the 1996-2000 period in the Central Volcanic Cordillera Conservation Area. Allowing them to estimate the area under PES-Protection for which deforestation have been avoided to be 38%[16] of the area under PES contract. In their survey of the Osa region, Sierra and Russman (2006) conclude that the PESP has not allowed to reduce deforestation between 1997 and 2003 but that it has contributed to the increase of forest cover by making it easier to abandon agriculture, thus allowing the natural regeneration of forests through the conversion in "bush" of the lands.

It is worth reminding that additionality has never been mentioned as an objective of the program (Pagiola, 2008). The PESP does not target participants on the basis of the deforestation risk but rather on the basis of the areas' potential in terms of environmental services generation and fight against poverty. On the contrary, its philosophy is to «*to 'recognize' the environmental services of whoever is providing them* » and « *If their budget was sufficient they would pay every forest owner, as all forests are thought to provide environmental services*[17] » (Pagiola, 2008). Assessing the Ecomarkets project[18], Hartshorn and al. (2005) state that paying for the protection of forests that do not require protection measures, insofar as they would not have been deforested anyway, is an inefficient use of the of the scarce funds for conservation and recommend to focus the investments on the lands where they can be useful to change behaviours. The World Bank puts the emphasis in particular on the additionality criterion, especially with a view toward being able to access funding under the REDD[19] framework (Robalino 2009, interview). It is backed in this way by forestry organizations such as the ONF[20], Codeforsa[21], Fundecor[22]. These organizations wish

existing system of protected areas), the lands in wildlife protected areas, the lands in biological corridors, the indigenous territories, the distric with a low index of social development.

[16] 13% in the areas where the deforestation risk is low and 47% where it is high.

[17] "*If their budget was sufficient they would pay every forest owner, as all forests are thought to provide environmental services*"

[18] The Ecomarkets (« Ecomercados » in spanish) project has been funded by the Global Environmental Fund, the World Bank ad the Government of Costa Rica for the 2001-2005 period. This project of 62 millions USD aimed to strengthen and expand the PESP (Hartshorn and al. 2005).

[19] The Reduction of the greenhouse gas Emissions from Deforestation and Forest Degradation is an initiative aimaing at offering financial incentives to developing countries to avoid deforestation and forest degradation. The 15th Conference Of Parties at the United Nations Framewok Convention on Climate Change that took place at the end of 2009 at Copenhaguen confirmed the need to include this approach in the fight against climate change. UN-REDD state that the financial flows in the REDD framework could reach 30 billons USD per year, thus becoming a major channel for rural development in developing countries.

[20] The national Forest Office instituted by the law 7575 represents the whole forestry sector.

[21] The Commission of Forest Development of San Carlos is a NGO created in 1983 which is today active in the northern area of the country (http://www.codeforsa.org).

the areas of the agricultural frontier most threatened by deforestation were included in the PESP-Protection priority areas, for which the program could mobilize funds on the carbon international market in the REDD framework (Mendez 2009, interview).

2. The impacts on the generation of environmental services

We will assess on the one hand to what extent the PESP beneficiaries have really implemented the agreed (forest) land uses, and, on the other hand, if these land uses do generate the expected ES.

On the first issue, Pagiola (2008) says that « *the PSA program has established a strong system to monitor land user compliance with payment contracts»*. This monitoring is made easier by the uploading on the GPS of the maps of the farms under contract, and is carried out through field visits, forest covers studies through Landsat 7 (since the mid 2000s) and aerial photographies (Arce and Navarrete, 2009, interview). However, in the first years of the program, deficiencies in the compliance to the forest management contracts and their control by forest regents in situation of conflict of interests[23], especially in the Osa region, have been denounced and have contributed to the exclusion of the forest management modality.

According to Pagiola (2008), **«** *It is unfortunately impossible to determine the extent to which the PSA program has successfully generated environmental services. Although the PSA program has established a strong system to monitor land user compliance with payment contracts, the program, the program remains weak in monitoring its effectiveness in generating the desired services* **»**. However, while the ES generated by the program have not been measured directly, their generation can be estimated indirectly through the study of the characteristics of the PESP areas of intervention.

Before analyzing in more details the generation of environmental services according to each type of service, we can notice that the capacity of some land uses promoted by the PESP to generate the expected environmental services has been contested. Some ecological

[22] The Foundation for the Development of the Central Volcanic Cordillera is an NGO founded in 1989 which has played a key role in the PESP design. http://www.fundecor.org

[23] In the framework of the PESP, the forest regents are in charge of designing the management plans of the areas under contrat and to monitor their implementation. They often find themselves in a situation of conflict of interests as they are paid and recruited by the land owners they are supposed to control.

organizations have considered that the forest management modality has not generated the expected environmental services, biodiversity conservation in particular, which contributed to the exclusion of this modality in 2002. They have denounced the degradation of forest that resulted – according to Baltodano (2009, interview) the « forest management » modality allowed to cut 28% of the forest - through the openings of paths, the falls of trees, the selection of trees in capacity to reproduce themselves and having the best reproduction characteristics. On the contrary, according to Navarro (2009, interview), the CATIE chair of forest ecology has demonstrated that forest management, as it is promoted in the PESP[24], generates comparable results in terms of biodiversity (structure and composition) as the ones generated by a forest under conservation. Furthermore, some ecological organizations (Baltodano 2009, interview; Figuerola 2009, interview; Jimenez 2009, interview) have underlined that the forest plantations (« existing plantations » or « reforestation » modalities of the PESP) do not generate biodiversity conservation services (as they are often monocultures using introduced species) and hydrological services.

The PESP impact in terms of hydrological services seems weak. Until now, the PESP has been largely[25] focused on the areas where few hydrological services were likely to be generated and a relatively low number of important areas from a hydrological point of view has been incorporated to the PESP (Pagiola, 2008). In addition, the idea that forest land uses promoted by the PESP would improve the hydrological services is based upon a belief very rooted in Costa Rica and in the rest of Central America that the forest are always beneficial to hydrological services (Pagiola 2002, Kaymowitz 2000) while this link is in fact not well established scientifically[26] (Pagiola 2008, Bishop and Landell-Mills 2002, Smith and al. 2008, Reis and al. 2007). Nevertheless, in Costa Rica, the main concern is about water quality for which the link with forest cover is better established (Pagiola, 2008). However, the monitoring of the impact of land uses promoted by the PESP on the hydrological services has not been carried out yet in Costa Rica (Pagiola 2008) but it will be in the future on pilot projects in the framework of the MMBIEM project[27]. Finally, two evolutions of the program

[24] The farming intensity was less than 10 m3, that is to say between 2 and 3 trees on 400 per hectare every 15 years (Navarro, 2009 interview)

[25] In 65% of the cases according to Tattenbach and al (2006) quoted by Pagiola(2008), using datas from Fallas (2006)

[26] Especially regarding the link between forest cover and water volume or the availability of water during the dry season.

[27] The « Mainstreaming Market Based Instruments for Environmental Management » project (commonly called Ecomarkets II) is a 80 millions USD project from the Global Environmental Fund, the World Bank and the

should allow the improvement of hydrological services generation. The introduction of the water tariff as a mean of funding the PESP should improve the targeting of the important areas from a hydrological point of view as the decree establishing it mentions that the resources it generates should be spent at the level of the same watershed (Pagiola 2008). Moreover, the hydrological importance has been established as a targeting criterion since 2009.

The estimate of the PESP impact in terms of biodiversity conservation can be carried on by studying to what extent the lands enrolled in the PESP are located in priority areas for biodiversity conservation. These priority areas have been identified at the national level in 1996 by the GRUAS study, a proposal of land uses planning for biodiversity conservation that served as a basis for the definition of PESP priority areas[28]. In 2003, a broader definition of these areas includes the priority biological corridors identified by the Ecomarkets project and the SINAC[29]. In 2005, some 30% or 59% of the active contracts correspond to priority areas for biodiversity conservation according to the narrow (of 1996) or broader (of 2003) GRUAS definition. The proportion of contracts corresponding to these priority areas, in its broader definition, has increased since 2003. Due to the efforts of FONAFIFO since it took on the responsibility of the application process instead of the SINAC[30] (Pagiola 2008). Tattenbach and al. (2006) got a similar outcome:, 65% of the areas under PES contract zones in 2005 correspond to priority areas for biodiversity conservation. Using their model of avoided deforestation, they thus estimate that the PESP has allowed to prevent the loss of 72 000 hectares of forests in priority areas for biodiversity conservation between 1999 and 2005.

Governement of Costa Rica supporting the development of the PESP during the 2007-2012 period (World Bank, 2006)

[28] The proposal aims to make sure that at least 90% of the country's biodiversity, using as an indicator the macrotypes of vegetation, will be conserved. This conservation strategy propose to include 9 additional macrotypes of vegetation to the 22 already present in the protected area system through the expansion of this system and 8 others macrotypes through conservation at the private properties level. This study has been updated through a work launched in 2004 and which was still going on in 2009. The GRUAS II project aims to identify not only the types of vegetation but also the fresh water and coastal-marine ecological systems and species that are not adequately represented in the current network of protected ('the conservation blanks"). (http://www.gruas.go.cr/)

[29] According to the biodiversity law (1998), the National System of Conservation Areas is an institutional system of decentralized and participative management that integrates the skills of the Ministry in charge of the environement (MINAE) in terms of forestry, wildlife and wildlife protected areas in order to dictate the policies, plan and implement processes aiming at the sustainability of natural resources management of Costa Rica. The SINAC is made of 11sub-systems called conservation areas and a central office. (http://www.sinac.go.cr/informacion.php)

[30] The proportion of new PES contracts in the GRUAS areas and the priority biological corridors identified by the Ecomarkets project and the SINAC has increased from 35,2% in 2002 to 66,7% in 2003 (this rate was lower than 48% between 1999 and 2002 and was higher than 60% between 2003 and 2005).

According to the assessment of the Ecomarkets project (Hartshorn and al. 2005), more than 70% of resources (either in terms of area covered or in terms of numbers of contracts) of the PESP are allocated to priority corridors from the point of view of biodiversity conservation in 2005, versus 58% during the 1999-2002 period considering the number of contracts. This can be explained by the fact that PESP areas of intervention are too scattered: in 2005, about 70%[31] of the country's territory is located in at least one of the different priority areas (GRUAS, SINAC, Mesoamerican Biological Corridors and cantons of low index of social development[32]). According to Arce and Navarrete (2009, interview) in the framework of the MMBIEM project, a monitoring of biodiversity is carried on since recently by the INBIO[33] in some pilot areas of the program, without yet any available results.

According to Pagiola (2008), The PESP has sequestered around 1 million tons of carbon between 1998 and 2005[34] through the « new plantations » modality (PES-Reforestation) that has concerned 21 000 hectares. « *As the bulk of area contracted was under the forest conservation contract, however, the extent of carbon sequestration services the PSA Program has generated is driven primarily by avoided deforestation, and so cannot be estimated without better estimates of actual land use impact* » (Pagiola, 2008). Indeed, we have seen that the estimates of the additionality of the PESP-Protection vary strongly depending on the authors. While the most optimistic think the PESP has allowed to avoid deforestation in 38% of the cases (Tattenbach and al. 2006), Most of the authors (Pfaff and al. (2007), Robalino and al. (2008), Sierra and Russman (2006)) consider its impact on deforestation to be very weak. According to the most optimistic estimate (Tattenbach and al. 2006[35]), the PESP has allowed to reduce of some 11 millions of tons of carbon between 1999 and 2005.

[31] About 60% in 2004 according to Engel and al. (2009)

[32] This index is defined by the MIDEPLAN, ministry of national planing and economic policy, and aims at bringing the public policies around to the less developped areas of the country and at carrying on the monitoring of their social development. It measures at the countries' districts and cantons levels the social development from 7 variables: school infrastructure, access to special educative programs, childhood mortality, the relation between the mortality of the children less than 5 years-old and the overall mortality, the size backwardness of the children in first grade (« primer grado »), the average residential electricity consumption, the births of children from a single mothers.

[33] Founded in 1989, the National Institue of Biodiversity is a NGO dedicated mostly to the realization of the inventory and monitoring of the country's biodiversity as well as its conservation through the sharing of knowledge and its valorization through bio-prospection contracts. http://www.inbio.ac.cr/es/default.html

[34] Considering the hypotesis of a sequestration rate of some 10 tons of carbon per hectare per year, until a maximum of some 100 tons of carbon per hectare (Catie, 1999).

[35] Using their avoided deforestation model and an estimate of some 100 tons of carbon sequestered per hectare in existing forets (Pagiola and al, 2008)

Altogether, the PESP has weak effects on hydrological services generation, uncertain effects on the mitigation of greenhouse gases emissions and rather positive impacts on biodiversity conservation.

3. *The sustainability of the PESP environmental impacts*

From a contractual point of view and in the case of contracts for forest protection (PESP-Protection), there is no expectative of sustainability apart from the renewing of the contracts[36], which is what FONAFIFO tries to do to the extent of the available resources, except for the contracts concerning non priority areas (Pagiola, 2008). In the case of the plantation contracts (PESP-Reforestation), beneficiaries have the legal obligation to maintain the trees during 20 years, which is to say after the end of the payments. The difficulties met by the land owners between the end of the payments (after 5th year) and the wood farming (the twentieth year) have led to the increase of the amount of the payment for the PESP-Reforestation from 600 to 816 USD between 2004 and 2005 and from 816 USD to 980 USD between 2008 and 2009.

The most important factor of the sustainability of the program is its financing. From this point of view, the dependency of the PESP on the tax on fuel is worrying as pressures could be exercised to reduce it in the future, for example in the case of an important increase in energy price. Individual contracts with water users are a source of sustainability of the program and their renewing is encouraging but they only represent a small part of the funding: 2,6% of the funds distributed between 1997 and 2009 (FONAFIFO). The same is true for the environmental services certificates, mechanism launched in 2001 aiming at raising funds from voluntary private companies from sectors such as transport, industry, as an expression of their corporate social responsibility in order to increase and diversify the funding sources of the program: it has allowed to ensure only 0,2 % of the total funding of the PESP between 1997 and 2009 (FONAFIFO)[37]. The implementation of the water tariff is encouraging as it should generate, once it is completely implemented, 5 millions of USD per year (Pagiola, 2008). FONAFIFO hopes also that the carbon sales on the international market could generate some

[36] As we have already mentionned, deforestation is forbidden, which allows to some exten the sustainability of gorest protection.

[37] Since its creation, 71 contracts of funding have been signed by private companies. In order to better « sell » this funding (market segmentation), several certificates exist today focusing on biodiversity and scenic beauty (« Forest alive » - « Bosque vivo »), on hydrological resources protection ("life water " - « agua vida ») or on compensation of CO2 emissions of transports ("clean travel" - « viage limpio ») (Garcia, 2010, interview)

1 million USD from 2012. FONAFIFO has indeed identified in the country 1, 1 million hectares of « Kyoto lands », which is to say lands deforested before 1990 that can be subject to reforestation or afforestation. In 2007, a sale of 0, 61 million of tons equivalent CO2 to the World Bank's Biocarbon Fund has already been carried on (Pagiola, 2008). The funding of the PESP for biodiversity conservation purpose becomes an important issue to complete the fundings obtained owing to carbon storage and water services which remain limited (Only the PESP-Reforestation on « Kyoto lands » can today find investments in the regulated international market, and the water tariff has to be used in the watershed where it has been generated) (Pagiola 2008). In this view, FONAFIFO has created, in the framework of the Ecomarkets project, a trust fund, the « *Fund for Sustainable Biodiversity*[38] » that has received an initial grant from the GEF of 8 millions USD in the framework of the MMBIEM project and is expected to receive others grants and incomes from the sale of conservation certificates on the voluntary market[39] (Pagiola, 2008). It is still too early to assess the success of these funds to ensure a sufficient and sustainable funding for biodiversity conservation.

Beyond the established contractual obligations, PESP effects on the long run can also be assessed looking at its capacity to make social norms and values regarding forest conservation evolve. This aspect has been little studied until now and there is no consensus about it. Hartshorn and al. (2005) say that « *PSA contracts may contribute to environmental protection indirectly by making the social norms and preferences of the participants more conservation-oriented* », thanks in particular to the institutionalization of the recognition of environmental services value. This perception change of forest ecosystems has been noticed by several studies. Locatelli and al. (2007) have studied the perception of the participants to the PESP-Reforestation in northern Costa Rica through a multicriteria analysis. They noticed that this program has improved the participants' consciousness of the importance of the ES provided by forest and has incited them to conserve the forest. 57% of their program participants sampled have thus declared that they would continue to reforest even without receiving PES and 65% said they had implemented measures to conserve biodiversity, ecosystems and water after having integrated the program. According to Ortiz and al. (2003), 95% of the beneficiaries PESP-Protection interviewed think that the program has taught the people to value the forest and 93% think that thanks to PESP, landowners are more concerned than before the program about the

[38] "Fondo para la Biodiversidad Sostenible"

[39] The MMBIEM projet foresee a funging of 8,1 millions USD form the Governement of Costa Rica and of 0,4 million for the sale of carbon credit (World Bank 2006)

maintenance of forest, water, fauna and flora[40]. Hartshorn and al. (2005) noticed that the PESP does not explicitly provide conservation education materials to participants. Miranda and al. (2003) and Locatelli and al. (2007) mention however that forest organizations that serve as intermediaries in the framework of the PESP have played a key role in spreading environmental information and education. Nevertheless, none of these studies have used a test group constituted of non-participants to the PESP in order to isolate the effects of the PESP from the others possible causes, which makes it impossible to conclude on this issue. On the contrary, Furst (2009, interview) thinks that a contractual and utilitarist logic that remunerates land owners at the level of their opportunity costs does not represent a robust solution for long term conservation: « *When it will no longer be convenient for him, he [ndlr : the program participant] will break this agreement to go on deforesting.* […] *That is not based on a system of environmental protection with a social ground and I think that this is necessary to have conservation on the long run. The logic is too mercantilis*tic[41] ».

2. The costs of the Costa Rican PESP

In order to assess the performance of the program from the point of view of its costs, we first study the level of the transaction costs, then the level of the payments (which are supposed to correspond to the estimate of the opportunity cost associated to the restrictions of use), before comparing the cost of the PESP to those of the implementation of protected areas delivering the same environmental outcomes.

1. The transaction costs

A distinguishion among the transaction costs is being made, the costs of access to the program borne by the participants (the laying out of the application folder including the design of a management plan, monitoring of the contract compliance) and the administrative costs of FONAFIFO functioning. In this study the costs associated to the design of the program are not considered, due to the lack of information available .

[40] The focus groups led by Ortiz and al. (2003) give more mixed results; the answers of the PESP participants vary depending on the regions, some thinling that the PESP has reinforced environmental consciuousness while others don't think this is the case.

[41] "*Cuando a él, ya no le conviene más, va a quebrar este acuerdo y seguir con la desforestación.* […] *No está asentado en una protección del ambiente que tiene un fundamento social y yo creo que es necesario para tener una conservación a largo plazo. La lógica es demasiada mercantilista.*"

The estimates of access costs to the PESP bear by the participants vary from 12 to 18% of the payments total amount according to Miranda and al. (2003) or from 22% to 25% including others taxes according to Baltodano (2000) quoted by Locatelli and al. (2007).

FONAFIFO functioning costs have been initially limited by the law in 1996 to 5 % of the PESP budget, and then this limit has been raised to 7% in 2003. The program appeared then particularly competitive in controlling its costs : according to Ferraro and Kiss (2002), in the USA, administrative costs often represent 25% of the budgets of the conservation contracts while in the case of Water Conservation Fund in Quito, these costs are estimated between 10 to 20 % of the payments channelled through the fund (Landell-Mills and Porras, 2002). However, the institutional transformation of FONAFIFO into a classic public institution made its costs boom since 2008 to reach 22% of the budget in 2008 (Mendez 2009, interview; Vega 2009, interview).

The analysis of the Costa Rican PESP shows that transaction costs represent some 40% of the total amount of the channelled payments, without considering the costs of the program design. This amount is higher than the level of transaction costs usually observed in developed countries and stands in the highest part of the bracket of the carbon sequestration program's transaction costs in developing countries[42] (Wunder 2007). The PESP costs thus appear, since their substantial increase in 2008, relatively high.

2. The level of payments

Some 175 millions of USD have been channelled through the PESP between 1997 and 2008. In 1997, the prices proposed for the modalities of protection, of forest management and of reforestation were respectively 227 USD[43], 365 USD and 545 USD per hectare for the whole duration of the contracts which are 5, 5 and 8 years. If this amount was supposed to correspond to the minimum by the populations (comparing to alternative uses such as intensive livestock in particular), the importance of the demand, which is almost three times higher than the possibilities of funding (Rojas and Aylward, 2003), show that is in fact very attractive. Furthermore, these amounts have raised due to political pressures from the PESP

[42] According to Wunder (2007), the transaction costs of the Canadian program of land diversion represent some 25% of the total costs while those of the conservation reserve program in the USA are probably lower (quoting OECD 1997). The transaction costs of the carbon sequestration programs in developing countries vary between 6 and 45 % of the paiements (quoting Cacho and al. 2005).

[43] The exchange rate used is from the 31/12/2006.

beneficiaries. The prices of the protection and reforestation contracts reached respectively 320 USD/ha and 816 USD/ha in 2005. In 2009, they came to a maximum of 400 USD/ha for some protection contracts and to 980 USD/ha for the reforestation contracts[44]. As these increases of prices were not necessary to find a sufficient number of people wishing to participate to the program, the program already facing a too high demand, we can conclude that they result in a decrease of the program efficiency. These price increases seem to be part of a search for a better social impact, which would indicate that the search for efficiency is not the only driving force of the PESP evolution. The idea in part 3 is to search if the PESP efficiency can be substantially improved through the differentiation of payments amounts according to the opportunity costs of the beneficiaries but that this presents some risks.

3. The comparison with another conservation scheme, the protected areas

According to Sage (2000), the protection cost over 30 years of the forest resources through the PESP is largely lower (from 1,4 to 3,2 times less expensive depending on the hypothesis set) than the traditional system of land buying by the state and protection through a national park. This result is confirmed whatever the discount rate set (between 6% and 16%) and including while overestimating the PESP costs of 20%. This study does not compare the costs and not the benefits generated by each scheme, those being considered arbitrarily as equal. The author notices that the buying of lands for the setting up of protected areas is becoming more and more difficult, because of the lack of funds of the Costa Rican state to pay the land owners - 44% of the lands declared as protected areas had not yet been paid to their owners in 2000 (quoting the newspaper « La Nación » of February 2000, p. 4A) – but also because there is more legal possibilities of appeal that the land owners can mobilize in case of disagreements regarding the value of the lands.

Hartshorn and al. (2005) estimate also the conservation cost per hectare on a period of 15 years through the PESP in its modality of protection is 3 to 4 times lower than the cost of others instruments, such as public lands purchase for protected areas.

[44] In 2009, prices for the forest protection modality range from a minimum of 320 USD/ha in particular for the lands located within the protected areas to 375 USD/ha for the lands located within the « conservation blanks» (« vacios de conservación »: areas of importance for conservation but not yet covered by the existing network of protected areas) to reach a maximum of 400 USD/ha for the lands located in areas of hydrological importance. The prices for the reforestation modality raised from 816 USD/ha in 2005 to 980 USD/ha in 2009 while the prices for the modality of natural regeneration range in 2009 from 205 USD/ha to 320 USD/ha depending on whether or not these lands allow the commodification of the carbon sequestered.

However, for some actors, the amounts disbursed since the creation of the PESP have not generated any guarantee of forest conservation for the future, thus differing from the system of land acquisition by the state. They estimate that a balance should be looked for between the amounts allocated to the PESP and those allocated to the payments of the owed amounts by the state to the ex-owners of the lands located within the protected areas (Matamoros and Piva 2009, interview ; Araya 2009, interview). According to Araya, the ex-executive director of FONAFIFO, the state would owe some 150 millions of USD for the acquisition of 86 000 hectares of lands within national parks and biological reserves.

3. What potential for improving the PESP efficiency?

1. A potential for improvement on the short run…

The improvement of the PES efficiency can be reached through two levers: the improvement of its effectiveness and the decrease of its costs.

First, it seems that FONAFIFO functioning costs could be reduced as they have recently boomed because of its change of the legal status from a private to public management which forced FONAFIFO to increase its numbers of employees and global wage costs and this without resulting in an improvement of the program effectiveness[45].

Moreover, according to Pagiola (2008), the lack of targeting and the undifferentiated level of payments, which are early characteristics of the program inherited from the former forest incentives programs, are sub-optimal: they don't allow in fact to generate the maximum of ES (through the targeting) at the best cost (through payments adjusted to the opportunity costs of beneficiaries). However, improvements have been implemented regarding theses issues with the definition since 1999 of targeting criteria and the differentiation of payments since 2009 within the protection and natural regeneration modalities. The same is true for the monitoring of ES generation that was included recently in some pilot contracts in the framework of the MMBIEM.

[45] This would imply presumably to come back to the previous system where FONAFIFO was managed according to the private labor law, which is unlikely.

Wunscher and al. (2008), using the example of the Nicoya peninsula, estimate that with constant costs, the ES production could be doubled, through a better targeting of the lands integrated to the program and a flexibilization of the payments to adjust them at the costs borne by the participants because of conservation. They estimate that the biggest part of the potential for efficiency improvement (+93% on a global improvement potential of +105%) come from the payments flexibilization to adjust them to the big variations in terms of costs borne by the beneficiaries because of their participation: opportunity costs, transaction costs and the direct costs of implementing the measures required in the framework of the PESP-Protection. The use of an ES production index to target the lands to be integrated in the program leads to a moderate improvement of the PESP efficiency. Finally the targeting of the lands using the deforestation probabilities turns out to be not very attractive because of the low variations of the deforestation risk within the region[46] (Wunscher and al. 2008).

The concrete implementation of this tool allowing the targeting of the lands (according to their deforestation risk and the capacity to generate ES) and the differentiation of the payments is facing several challenges: scientific ones (to access a very precise information regarding the participation costs of potential beneficiaries, the deforestation risk and the capacity to generate ES of the proposed lands), administrative ones (simultaneous decisions on all applications) but above all political ones (the most important challenge to the implementation of this tool would be political as it could seem unfair[47]) (Engel and al. 2009[48]). The increase of the transaction costs inferred by the implementation of this new tool seems negligible[49] according to Engel and al. (2009) as they are estimated at 0, 27% of the overall budget of the program each year.

[46] The low variations found in the study area between lands in terms of ES generated on the one hand and of deforestation risks on the other hand may be higher at the national level. Thus, using these two criteria to target PESP participants is probably more promising at the national level to improve the efficiency of the program than what found Wunscher and al. (2008) at the Nicoya peninsula level.

[47] Engel and al. (2009) think in particular that payments differentiation could be perceived as an arbitrary discrimination and unerline the role of transparency of the selection process to avoid this. They also notice that paying the land owners the minimum amount to secure their participation to the program and maximize the ES buyers' benefits can be perceived as « unethical » if these landowners are poor and the buyers are wealthier, which does not seem to be the case of the PESP. Finally, they remind that the PESP can be considered as a compesation for a stricter environmental legislation (deforestation prohibition) rather than for achieving additional environmental benefits.

[48] Engel and al. (2009) present the same case as Wunscher and al. (2008). They are in fact the same authors.

[49] They recognize however that FONAFIFO may not share their vision.

2. … which may reveal itself counterproductive on the long run

If the targeting and the payments differentiation can be considered as options for improving the PESP on the short term, it is necessary to take into account the impacts of these options on the social norms and values plus the legitimacy of the program to estimate the improvement potential of efficiency on the long term.

Indeed,is possible to speculate about the impact on social norms and values of the efficiency gains resulting from a decrease of prices as it is the case because of the flexibilization of payments in the most efficient approaches identified by Wunscher and al. (2008). The environmental effectiveness of an extremely low valuation of ES seems questionable from the point of view of the long term objective of a better valuation of immaterial benefits provided by forests within the Costa Rican society, which has been the founding principle of the PESP creation and one of its main justifications (Gonzales, interview 2009). According to Kosoy and al. (2007) or Muradian and al. (2009), the level of the payments received does not allow in some PES schemes[50] to compensate integrally the opportunity costs of numerous beneficiaries, who nevertheless participate to the programs as they would have conserved the forest anyway due to social and cultural norms and values. The role of the payment is not to change behaviours, the payments being too low to incite the actors prone to deforest not to do it, but rather to reinforce « *good environmental stewardship* ». (Kosoy and al. 2007 ; Corbera and al. 2009). This is often the case of the Costa Rican PESP (Miranda and al, 2003 ; Ortiz and al., 2003), which indicates that if the payments were too low they could result counterproductive. As a matter of fact, extrinsic rewards can impact negatively on intrinsic motivation (Deci, Koestner, and Ryan 1999 quoted by Wunder 2005), such as the community's own interest or the pride derived from forest conservation. This risk seems particularly high in the case of payments of small amounts (Heyman and Ariely 2004 quoted by Wunder 2005) where the efforts in terms of conservation could result lower than in the case in which there would be no payment at all.

The same is true for the reconsideration of the egalitarian principle, by which the levels of payments are the same whatever the ES value or their generation cost are, that can allow to

[50] Kosoy and al. (2007) refer to the three cases in Central America they have studied: Jesus de Otoro (Honduras), San Pedro del Norte (Nicaragua) and Heredia (Costa Rica) while Corbera and al. (2009) refer to the Mexican national program of PES.

maximize the efficiency of the PESP on the short term but can jeopardize on the longer term as this principle is the pillar of the PESP legitimacy according to Pascual and al. (2009)[51]. Pascual and al. (2009) underline indeed the potential conflicts between the objective of egalitarian distribution of funds through payments of identical levels and the environmental objective of PES programs.

Finally, the search for additionality from the point of view of the fight against deforestation can create perverse incentives: channelling payments only towards the land owners that may degrade the environment can incite the people to degrade the environment if they are not paid for the ES they provide (Wunder, 2005). Some examples at the international level in the negotiations on REDD and the case of the PES RISEMP[52] project (Pagiola and al. 2004) underline this danger. This project initially foresees the payment for the incremental ES production, without taking into account the services provided by the existing trees. But the participants were threatening to cut down the existing trees to be able to benefit of the payments for the reforestation of a larger area. Furthermore, this approach presented the risk to discourage the non-participants to the program from the neighbouring areas to implement by themselves improved silvopastoral practices for fear of not being able in the future to benefit from the program. The program has thus decided to implement payments for pre-existing ES. The search for additionnality can also weaken the legitimacy of the scheme if all the environmental services providers are not rewarded but only those that may no provide these services in case there was no payment (Wunder, 2007).

Conclusion

The PESP has had therefore a low direct impact on the forest cover of the country. However, it is necessary to replace the PESP in the framework of a change in the forest policy of the country, especially the prohibition of forested land uses change, for which it has been considered as a compensation, to assess its positive indirect impact on forest cover. The ES generation by lands under contract seems globally satisfactory due to the improvement of the targeting of the lands integrated to the program. Nevertheless, this improvement is facing an inherent limit as the program pays for each contracted land four ES while trade-offs between

[51] Pascual and al. (2009) consider it the « fairness criteria » of the program.

[52] The Regional Integrated Silvopastoral Ecosystem Management Project funded by Global Environmental Fund aims to promote improved silvopastoral practices in degraded pastures areas through PES mechanisms. It has been implemented from 2002 to 2007.

these ES are unavoidable : the areas rich in biodiversity do not necessary correspond to the areas of hydrological importance for example. The PESP appeared also quite competitive regarding the level of transaction costs and functioning costs until 2008, before FONAFIFO functioning costs boomed due to its institutional transformation.

A significant potential for improvement of the PESP efficiency exists on the short term through the differentiation of the payments levels or through the targeting of the areas most prone to be deforested. Nevertheless, these recommendations do not take into account the institutional nature of PESP and the meanings that the stakeholders have given to this program and that ensure its legitimacy. In fact, this evolution would oppose some of its founding principles (non search of additionnality but rather compensation for ES provision, egalitarian principle for the definition of the level of payments), around which the different actors have built its legitimacy that secures its viability. Thus, according to Wunder (2005), « *a PES scheme needs to strike some balance between short-term efficiency and fairness, the latter influencing long-run conservation viability* ». Moreover, these recommendations, by giving priority to a purely utilitarian logic, may weaken on the long run the social norms and values impacting forest conservation and could eventually reveal themselves counterproductive (Martinez-Allier 2002, Clements and al. 2009, Kosoy and Corbera 2009, Vatn 2009). Indeed, according to Vatn (2009) « *by changing which perspectives and value apply, institutions have the capacity to change the logic of the situation. They act as rationality context* […] *It may change the logic from one where it is about what is better for the community to do to what is the better for oneself.* » Thus the search for the improvement of the PESP efficiency must take into account its potential effects on the long term and consider on the one hand the nature of this institutional arrangement in order not to undermine its legitimacy and on the other hand its potential impact on social values and norms dealing with conservation.

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